

Part III Neoclassical Trade Theory

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Part III Neoclassical Trade Theory

The classical theory is limited in their analysis by the labor theory of value and the assumption of constant costs. The neoclassical trade theory provides tools of analysis and studies the impact of trade in a more rigorous and less restrictive manner. The application of neoclassical theory and later refinements of these ideas constitute the basis of modern theory of international trade.

The principal changes in trade theory since Ricardo's time have centered on a fuller development of the demand side of analysis and on the production side of the economy that does not rely on the labor theory of value.

Chapter 6 Gains from Trade in Neoclassical Theory

The analysis of the neoclassical theory is essentially an updating of the Ricardian analysis to include increasing costs, factors of production besides labor, and explicit demand considerations.

1. Autarky equilibrium

FIGURE 1 Producer Equilibrium in Autarky

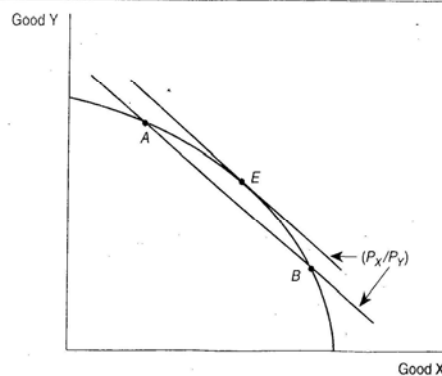
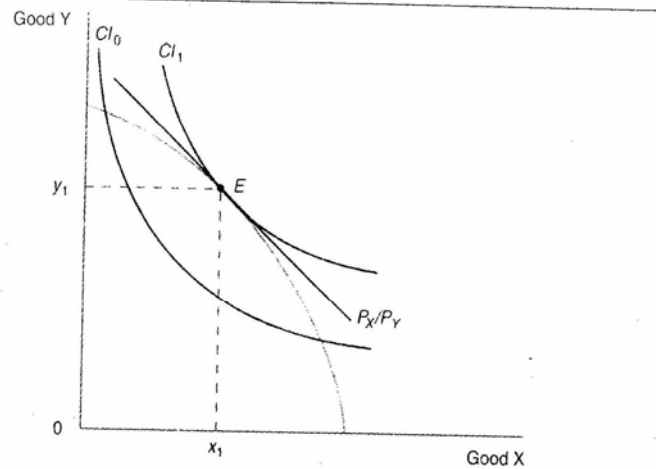


FIGURE 2 General Equilibrium in Autarky



In the graph, the equilibrium is at point E. At E, the slope of the budget constraint (P_x/P_y) is tangent to the slope of the PPF. The slope of the PPF is called the marginal rate of transformation (MRT). It is also known that the slope of the PPF is equal to relative marginal costs. So at E:

$$(P_x/P_y) = (MC_x/MC_y)$$

At E, the producers would have no incentive to change the production pattern unless relative price ratio changes.

We also introduce the indifference curve that is tangent to the budget constraint and the PPF. So we have the condition:

$$MRT = (MC_x/MC_y) = (P_x/P_y) = (MU_x/MU_y) = MRS$$

2. Introduction of International Trade

When the economy opens up to trade it would face a different set relative prices.

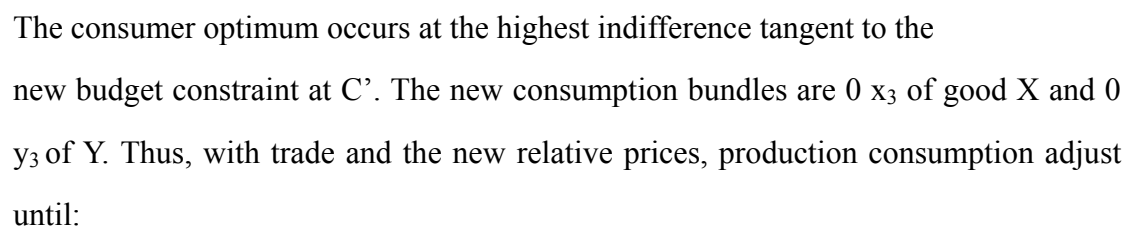
Consequently, domestic producers and consumers would adjust by reallocating their production and consumption patterns. Such reallocation would lead to gains from trade.

$$(P_x/P_y)_2 > (P_x/P_y)_1$$

The new steeper relative price means that for the home country before trade, the price of X is lower and the price of Y is higher than in international trade. So the home country has a comparative advantage in X and comparative disadvantage in Y.

The new steeper relative price means that for the home country before trade, the price of X is lower and the price of Y is higher than in international trade. So the home country has a comparative advantage in X and comparative disadvantage in Y.

What about home country's consumption? The relative price line tangent to E' is also the home country's trading line, or consumption possibility frontier. With production at E' the home country can trade along the new relative price. The amount of exports is x_3x_2 and the amount of imports is y_2y_3 .



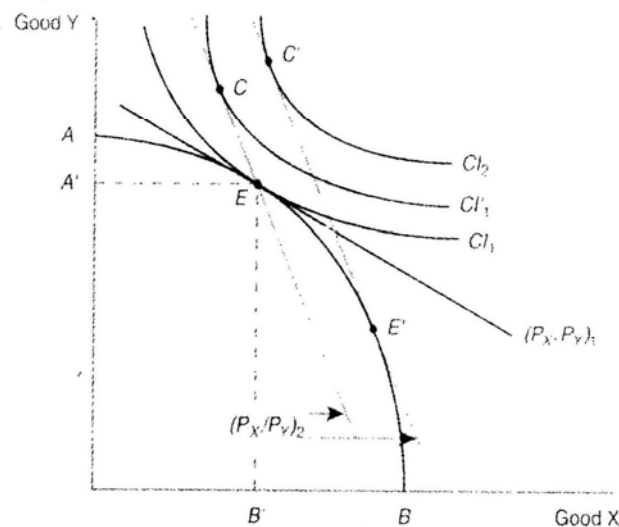
$$MRT = (MC_x/MC_y) = (P_x/P_y)_2 = (MU_x/MU_y) = MRS$$

C' is beyond the PPF. International trade permits consumers to consume a bundle that lies beyond the production capabilities of their own country.

Consumption and production gains

The home country's total gain is divided into consumption gain (gains from exchange) and production gain (gains from specialization). The consumption gain from trade refers to the fact that the exposure to new relative price, even without changes in production, enhances the welfare of the country. It is illustrated in the following figure.

FIGURE 4 Gains from Exchange and Specialization with Trade



When the country is introduced to the trading prices $(P_x/P_y)_2$, production does not change immediately. The change in relative prices will make the consumers to switch to the cheaper good. In this case, we can draw a line parallel to the new price ratio and through point E. The consumer will move to C where the community indifference curve is tangent to the new relative price line. Point C is higher than the community indifference curve in autarky. The extent of this gain is represented by the difference between the indifference curve CI_1 and CI_1' - consumption gain.

Further gain is achieved by the change in production. With the new relative price there is an incentive to move the production from E to E' in accordance with the comparative advantage. The economy will move to C to C'. This is the production gain.

In conclusion, production gain will not occur with rigid production pattern, only the consumption will occur.

Trade in partner country

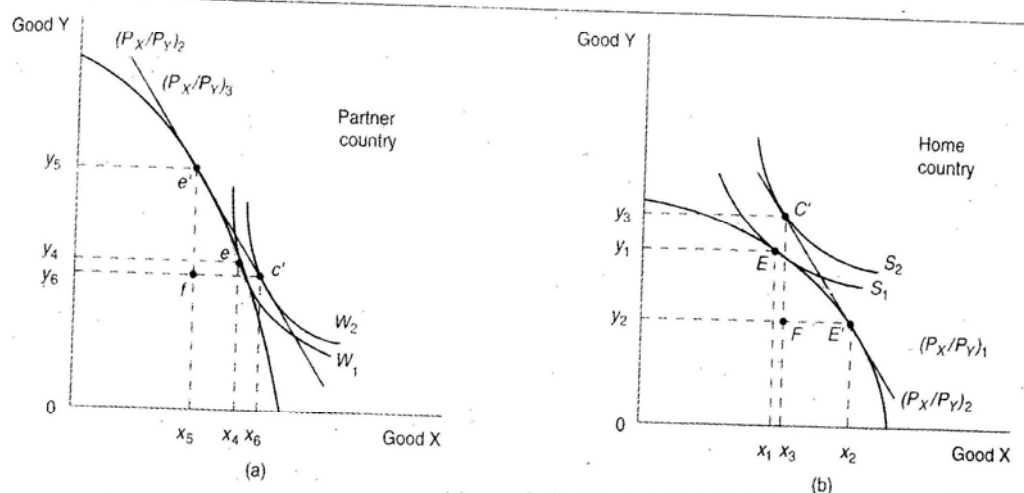
If we assume a two-country world the analysis for the trading partner is analogous to that employed for the home country.

For the partner country, the equilibrium is at point e in autarky. The partner faces a relative price $(P_x/P_y)_3$. At e it is producing X_4 and Y_4 and the welfare is indicated by the indifference curve W_1 . With trade the new relative price is $(P_x/P_y)_2$ and it is flatter than $(P_x/P_y)_3$.

The partner country has a comparative advantage in Y and comparative disadvantage in X. It should produce more of Y and less of X by moving from point e to point e'. From e' the partner country can move along the trading line to c'. The partner country's export is Y_5-Y_6 and import is X_6-X_5 .

It is obvious that the partner country can also gain from trade. With the trade it is able to reach indifference curve W_2 .

FIGURE 5 Partner Country Gains from Trade



3. Minimum conditions for trade

The discussion above has demonstrated that there is a basis for trade whenever the relative price of goods in autarky of the two trading partners is different. It is important to address the conditions under which this could come about.

Theoretically, the relative price differences could be generated by two sources: differences in supply conditions and differences in demand conditions. To establish the minimum conditions for generating relative price differences. We first look at the role of demand, assuming identical production conditions.

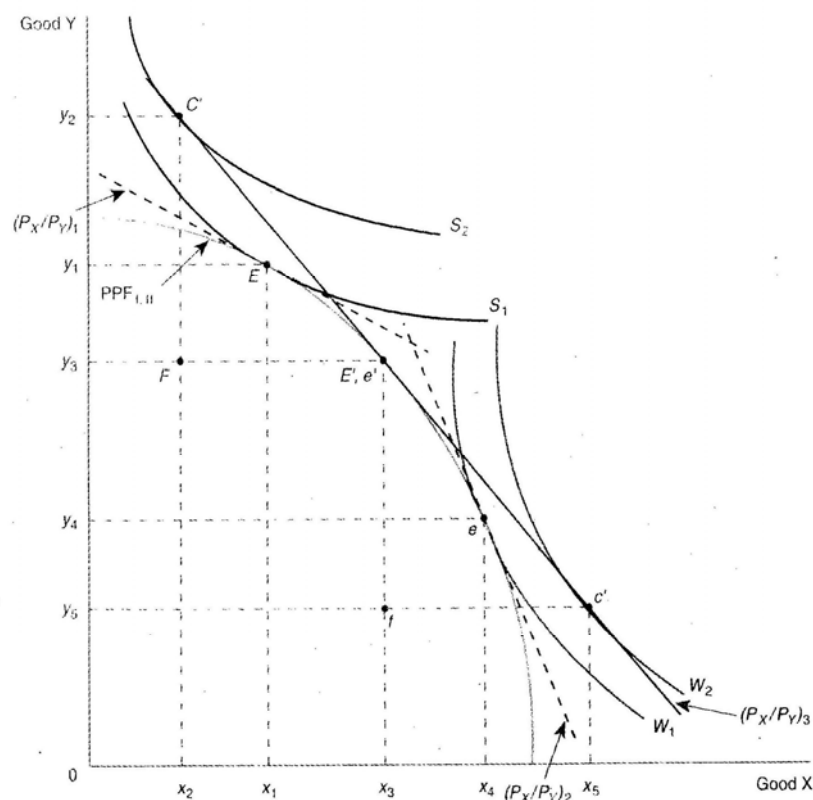
Trade between countries with identical PPFs.

This case could be handled in the Classical analysis. In Ricardian analysis, if the production for the trading partners in all commodities were the same (identical PPFs), the pre-trade price ratios in the two countries would be the same, there would be no incentive for trade and of course no gains from trade.

According to neoclassical theory, two countries with identical production conditions benefit from trade. Different demand conditions in the two countries and presence of increasing costs are the two principle conditions. The classical economists were not particular concerned with either. The latter condition-increasing costs play a more important role, but the recognition of different demand conditions influence trade is also necessary to update the Classical analysis.

The graph below illustrates this special case. Because the two countries have identical production conditions we need to draw only one PPF since it can represent either country. Different tastes in the two countries are represented by different indifference maps. Suppose Country I has a relatively strong preference for good Y and this preference is indicated by curves S_1 and S_2 , which are positioned close to the Y axis. On the other hand, Country II has a relatively strong preference for the X good, so its curves W_1 and W_2 are positioned close to X axis. Autarky equilibrium for country I is at point E and for Country II at e. Under autarky conditions, the price ratio for Country I is $(P_x/P_y)_I$ and for Country II is $(P_x/P_y)_{II}$.

FIGURE 6 Trade between Two Countries with Identical PPFs and Different Demand Conditions



Since $(P_X/P_Y)_I$ is less than $(P_X/P_Y)_{II}$, Country I has a comparative advantage in X and Country II has a comparative advantage in Y.

The price ratios show that the preference for good Y in Country I has bid up PY relative to Px. The preference for good X in Country II has bid up Px relative to Py. With trade, Country I should expand the production of X and export X. The production point moves from E to E'. Moving along the trading line, consumption of Country I is at point C'. Note that the relative price ratio with trade $(P_X/P_Y)_3$ has a slope between the two autarky price ratios.

For Country II, autarky production point is e. With trade it moves to point e', the same as Country I's production point. Country II will move its consumption point to c'.

Even though Country I and Country II have identical PPFs, the trade opening has resulted in higher levels of well-being for both countries. The common sense of the

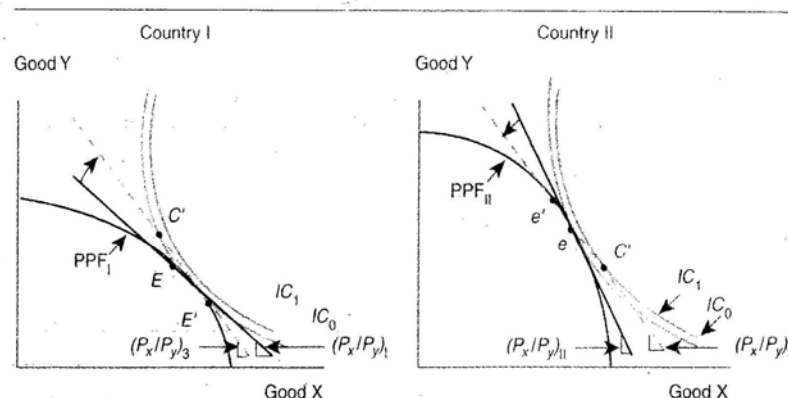
mutual gain from trade is that each country now is able to consume more of the good for which it has the greater relative preference.

Trade between countries with identical demand conditions

We turn to the situation in which two countries have the same demand conditions but different production conditions. This is caused by different technologies in the two countries so that their production possibilities are different.

PPF₁ demonstrates a technology that is relatively more efficient in the production of X and PPF₂ a technology relatively more efficient in the production of Y.

FIGURE 7 Trade between Two Countries with Identical Demands and Different Production Structures



With demand conditions assumed identical in both countries, an identical indifference map can be used to represent tastes and preferences. The different production conditions are sufficient to produce different domestic price ratios in autarky, even in the presence of identical demand conditions.

Country I will produce and consume at E in autarky and Country II produce and consume at e. Since relative prices are different in autarky there is a basis for trade.

With international terms of trade $(P_x/P_y)_3$, which lie between autarky prices of individual Country I will expand production of X to E' and Country II will expand the

production of Y to e' . Since demand is identical in the two countries, both will choose to consume at the point of tangency between the terms of trade and the highest possible indifference curve at C' and c' .

Chapter 7 Offer Curve and the Terms of Trade

The previous discussions of trade theory was based on the simplification the world prices after trade were assumed to be at certain level.

For example, in Ricardo model, we assumed that 1 barrel of wine would exchange for 1 yard of cloth in international trade and not investigate the factors that determine this relative price ratio.

Similarly, in later discussion related to PPF-indifference curve diagram, a given price was drawn and no attention was paid to the reason for this price ratio.

In this chapter, we explore how these international prices are determined. The important analytical tool and then use it to demonstrate how equilibrium prices are attained in international trade. The offer curve can also be used to explain the price and trade volume effects phenomena such as economic growth and changes in consumer tastes.

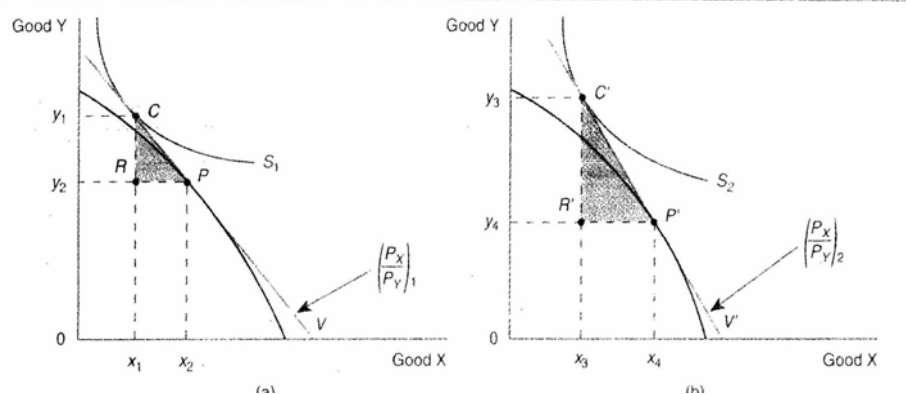
1. Derivations of Offer Curve

Definition: an offer curve (also called reciprocal demand curve) of a country indicates the quantity of imports and exports the country is willing to buy or sell on world markets at all possible terms of trade.

In fact, an offer curve is a combination of an import demand curve and export supply curve.

There are several methods to derive an offer curve. We will concentrate on the method that directly builds upon the PPF-indifference curve diagram. This method is called the trade triangle approach. Consider the two diagrams below.

FIGURE 1 Trade Triangles at Two Possible Terms of Trade



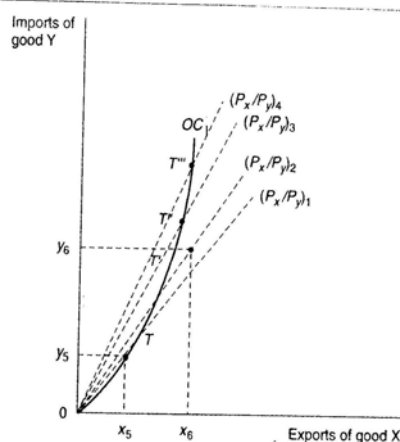
In the first diagram, the country is producing $0x_2$ of good X and $0y_2$ of good Y at point Y. With trade, consumption will take place at point C. As a result, x_1x_2 of X will be exported and y_1y_2 of Y is imported. The trade pattern is reflected in trade triangle RCP for relative price $(P_x/P_y)_1$.

In the second diagram, the country faces a steeper world price $(P_x/P_y)_2$. Given that price of good X is higher, the country would increase the production of X and decrease the production of Y. Production now takes place at P' , and consumption will take place at C' . x_3x_4 will be exported and y_4y_3 of Y will be imported.

It is clear from above analysis that different trade volume exists at the two different sets of prices. The offer curve simply describes the different levels of exports and imports corresponding to different levels of prices. The curve does not show production or consumption, but presents only the quantities of exports and imports.

We can plot relative prices $(P_x/P_y)_1$ and $(P_x/P_y)_2$ and corresponding quantities of exports and imports on the diagram below.

FIGURE 2 Alternative Terms of Trade and Export-Import Combinations on the C Curve



- (1) $(P_x/P_y)_1$ is the same as in the previous diagram;
- (2) P_x/P_y_2 is the same as in the previous diagram.
- (3) Angle $0VC$ in the first diagram is the same size as in the angle formed at origin in the offer curve figure above between say $(P_x/P_y)_1$.
- (4) The levels of imports and exports are the same as in the two previous diagrams.

So the construction of the offer curve is completed by connecting all possible points at which a country is willing to trade, with resulting curve labeled OC_1 .

We can also construct country II's offer curve. The only difference is country II exports good Y and imports good X. Thus country II's offer curve appears as curve OC_{II} . A lower (P_x/P_y) means that Country II has a greater willingness to trade, because a lower relative price for good X means a greater incentive to for country II to import it. Similarly, a lower (P_x/P_y) means a relatively higher price for good Y, leading to a greater willingness by country II to export it.

2. Trading equilibrium

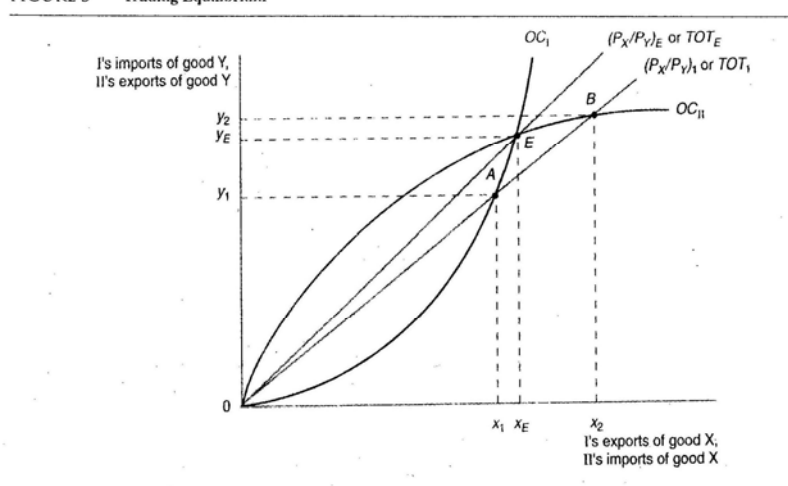
With two countries' offer curve brought together we can have the trading equilibrium and the equilibrium terms of trade. The horizontal axis indicates exports

of good X for country I and imports of good X for country II. Similarly, the vertical axis indicates country I's imports of good Y and country II's exports of good Y. trading equilibrium occurs at point E.

Why is point E the trading equilibrium? At point E the quantity of exports that I wishes to sell (OX_E) exactly equals the quantity of imports that country II wishes to buy (also OX_E). In addition, the quantity of imports that country I wishes to buy (OY_E) equals exactly the quantity of exports that country I wishes to sell (also OY_E).

So, relative price $(P_X/P_Y)_E$ are market-clearing prices, since the demand for and supply of good X on the world market are equal, as are the demand for and supply of good Y.

FIGURE 3 Trading Equilibrium



3. Shifts of offer curves

Suppose the consumers of country I change their tastes and decide that they would like to purchase more of good Y. Since Y is the import, this means an increase in demand for imports. In the diagram below, the offer curve shifts to the right from OC_I to OC'_I . Similarly, a decrease in willingness to trade will shift the offer curve from OC_I to OC''_I .

When offer curve shift, the equilibrium terms of trade and volume of trade change. Suppose country I and II are initially in equilibrium in figure below. The terms of trade is TOT_E and at trading volumes OX_E of good X and OY_E Y. There is a shift in taste by country I toward its import good Y. The offer curve shifts from OC_1 to OC'_1 . At TOT_E , there is excess demand for good Y and correspondingly excess supply of X. Country I is willing to buy OY_2 of Y and offer OX_2 of X in exchange. However, country II has experienced no change in its offer curve. It is still willing to supply OY_E of good Y and to demand OX_E of good X at TOT_E . With excess demand of Y_EY_2 for Y and excess supply of X_EX_2 for X, the price of Y will rise and price of X will fall. Such change will continue until market clears. The new equilibrium is at E' .

There is an exception with the shifts in offer curve. In case of a small country, the shifts in offer curve can not affect the terms of trade.

FIGURE 5 Shifts in Country I's Offer Curve

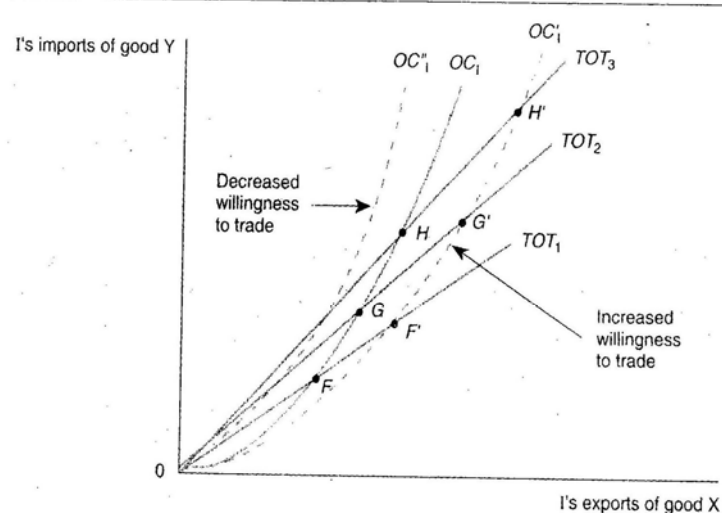
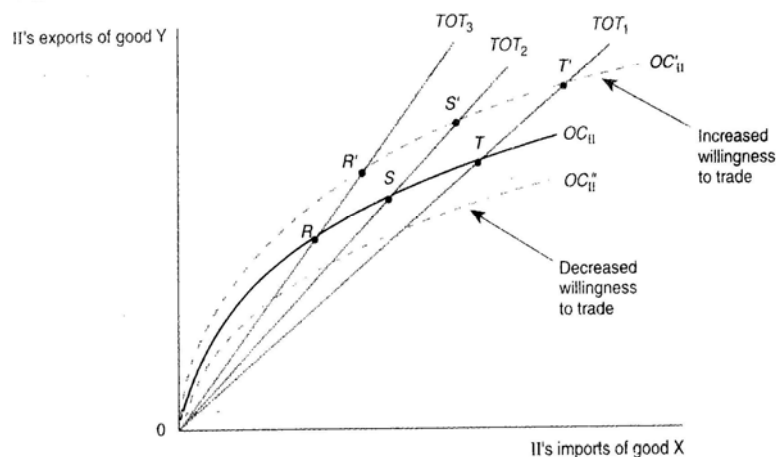
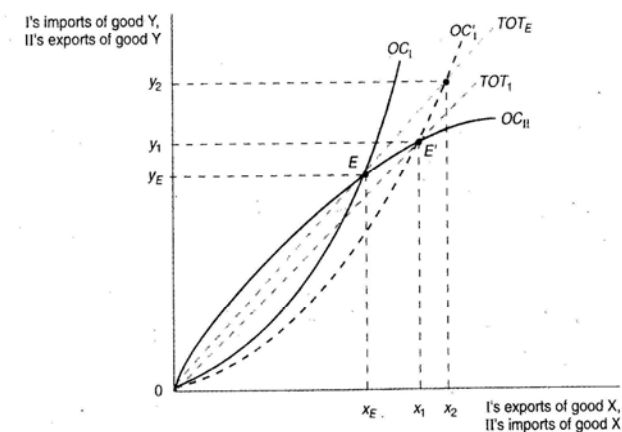


FIGURE 6 Shifts in Country II's Offer Curve



If country II increases its willingness to trade, its offer curve OC_{II} shifts diagonally upward to OC'_{II} , indicating a greater desire to trade at each

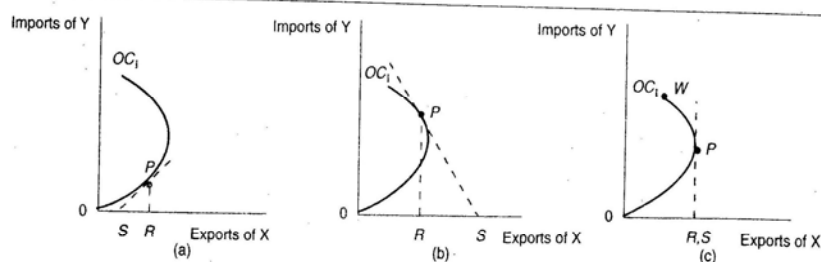
FIGURE 7 An Increased Demand for Imports by Country I



If country I's tastes shift toward its import good Y, OC_1 shifts to OC'_1 . At original equilibrium point E with TOT_E , there is now an excess demand of $y_E y_2$ for good Y and an excess supply of $x_E x_2$ of good X. The resulting fall in the terms of trade from TOT_E to TOT_1 eliminates the excess demand and supply. The new equilibrium position is point E' , with quantities $0x_1$ of good X and $0y_1$ of good Y being traded.

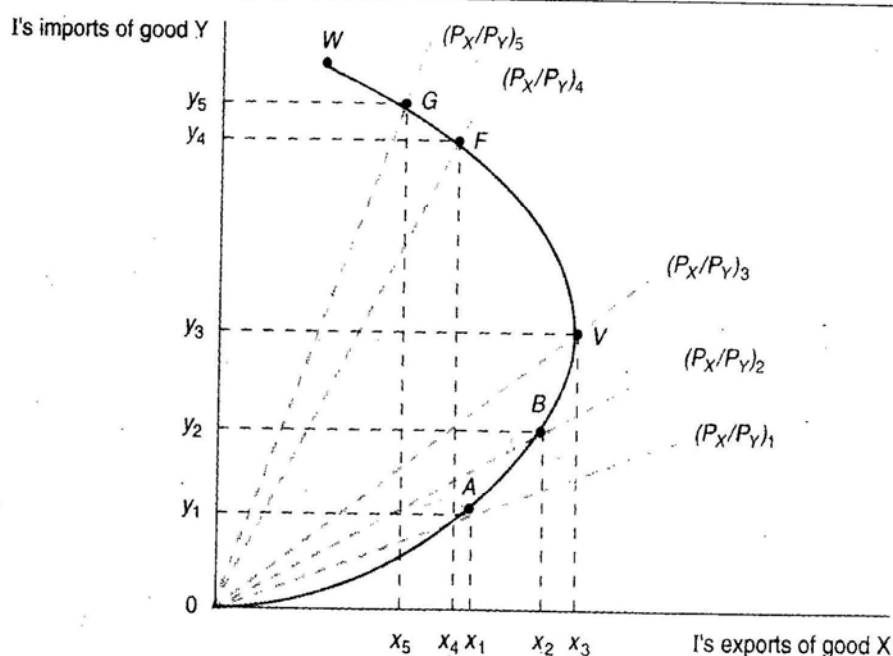
4. Elasticity and the offer curve

FIGURE 8 The Elasticity of Demand for Imports along an Offer Curve



The import-demand elasticity of the offer curve at any point is measured by the distance OR divided by the distance OS . In panel (a) the curve is "elastic" at point P because $OR > OS$ and therefore $OR/OS > 1$. In panel (b) the offer curve is "inelastic" at point P because $OR < OS$ and therefore $OR/OS < 1$. In panel (c) the offer curve is "unit-elastic" at point P since $OR = OS$ and therefore $OR/OS = 1$.

FIGURE 9 Elasticity Ranges and Export Quantities Given Up to Acquire Imports



the elastic range of the offer curve, when the relative export price rises (relative import price falls) from $(P_X/P_Y)_1$ to $(P_X/P_Y)_2$, the quantity of exports increases from $0x_1$ to $0x_2$ as more imports (y_1, y_2) are demanded; in inelastic range of the curve, when the relative export price rises (relative import price falls) from $(P_X/P_Y)_4$ to $(P_X/P_Y)_5$, the quantity of exports decreases from $0x_4$ to $0x_5$ as more imports (y_4, y_5) are demanded; and at unitary point V on the offer curve, an infinitesimal rise in the relative export price (fall in relative import price) from $(P_X/P_Y)_3$ would yield no change in the quantity of exports supplied by the country. These export quantity responses are analogous to the total spending (revenue) responses of consumers to a fall in the price of a good when demand is elastic, inelastic, and unit-elastic.

Chapter 8 The Basis for Trade: Factor Endowments and the Heckscher-Ohlin Model

In the previous discussions, we have shown that:

- (1) A country will benefit from trade whenever the terms of trade differ from its own relative prices in autarky.
- (2) The underlying basis for the relative price differences could be traced to difference in supply and demand conditions in the two countries.

In this discussion, we will examine in greater detail the factors that influence relative prices prior to international trade, focusing on differences in supply conditions.

What are the effects of factor endowments on international trade? The issue was first studied by two Swedish economists, Eli Heckscher (in 1919) and Bertil Olin (in 1933). The result of their study is the so called Heckscher-Olin Theorem:

A country will export the commodity that uses relatively intensively its relatively abundant factors of production, and will import the good that uses relatively intensively its scarce factors of production.

The theorem is based on the following assumptions:

1. There two countries, two homogenous goods and two homogenous factors of production whose initial levels are fixed and assumed to be relatively different in each country.
2. Technology is identical in both countries: that is, production functions are the same in the two countries.
3. Production is characterized by constant returns to scale for both commodities in both countries.
4. The two commodities have different factor intensities, and the respective commodity factor intensities are the same for all factor price ratios.

5. Tastes and preferences are the same in both countries. Further, for any given set of product prices, the two products are consumed in the same relative quantities at all level of income; that is, there are homothetic tastes and preferences.
6. Perfect competition exists in both countries.
7. Factors are perfectly mobile within each country and not mobile between countries.
8. There are no transport costs.
9. there are no policies restricting the movement of goods between countries or interfering with the market determination of prices and output.

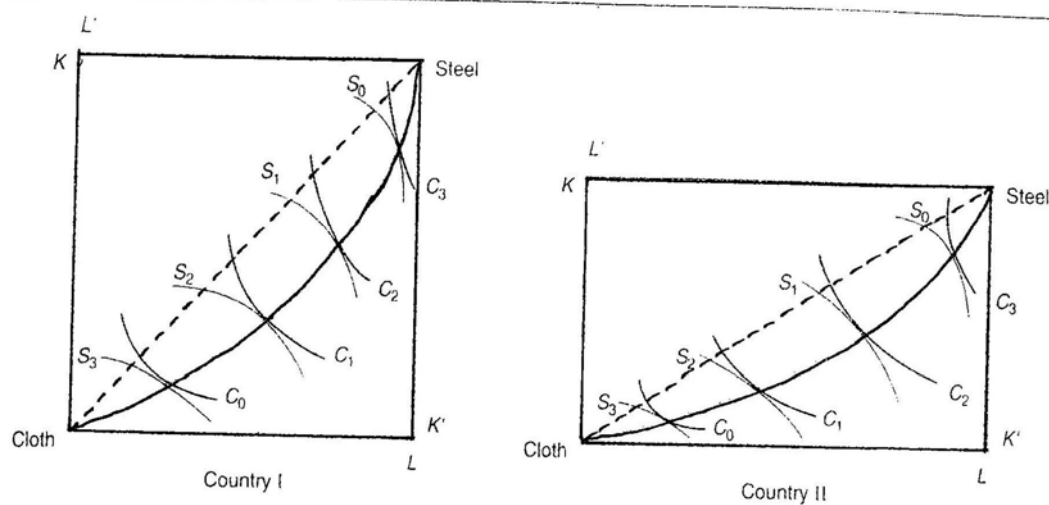
In fact, modification of these assumptions has led to the development of alternative trade theories.

In general, according to H-O Theorem, the country with abundant capital will be able to produce relatively more of the capital intensive good, while the country with abundant labor will be able to produce relatively more of the labor intensive good.

The Edgeworth boxes diagram below show that Country I is the capital-abundant country. This is evidenced by the height of the box (amount of capital) is greater whereas the length of the box (amount of labor) is greater for Country II.

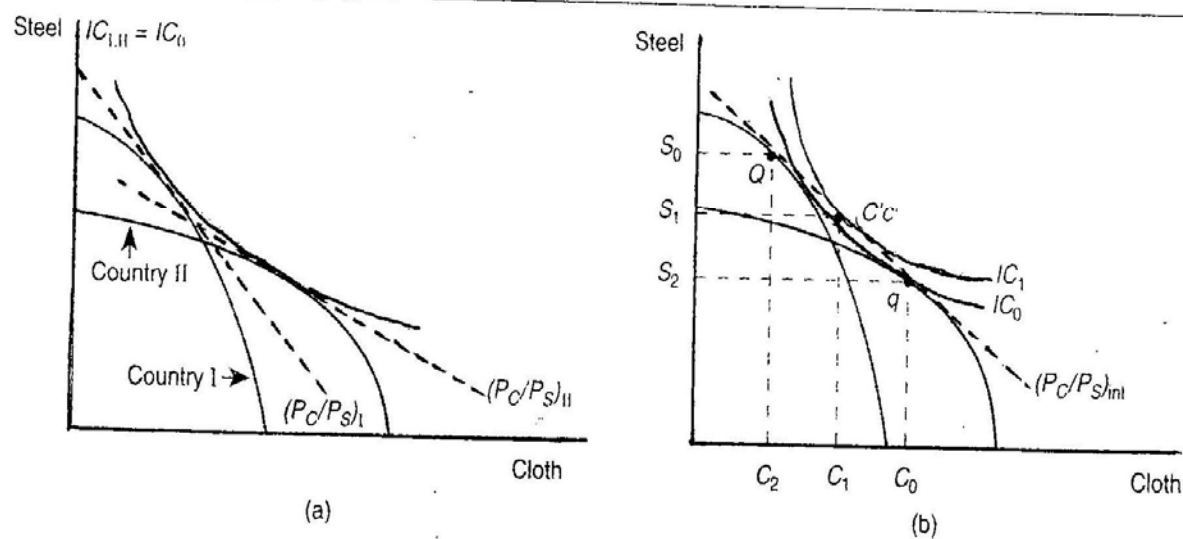
The slope of the diagonal reflects the K/L ratio and therefore, the relative endowment of the country. From the Edgeworth box diagrams, we know that the production possibility curves are different in both countries.

FIGURE 2 Different Relative Factor Endowments and the Nature of the Edgeworth Box



Based on the above box diagrams, we can draw the production possibility curves;

FIGURE 3 Gains from Trade in Two Countries with Identical Technology and Demands but Different Relative Factor Endowments



In the first diagram, the relative price of steel will be lower in country I (the capital abundant country) as reflected by steeper autarky price line, while the relative price of cloth will be lower in country II (labor abundant country) as evidenced by a flatter autarky price line.

Since relative prices in autarky are different between the two countries, a clear basis

for trade results from different factor endowments. The implication of this can be seen in the second diagram below. The International terms of trade must lie between the two internal price ratios, being flatter than the autarky price line in country I and steeper than the autarky price in country II. With the trade, a single terms of trade is $(P_c/P_m)_{int}$, tangent to both PPFs. For equilibrium to occur, country I exports steel (S_0S_2) and imports cloth (C_2C_1). Country II would export cloth (C_0C_1) and import steel (S_2S_1). When this occurs, both countries find themselves on a higher indifference curve IC_1 .

We can also demonstrate the relationship between relative factor prices and relative product prices with isoquant and isocost analysis.

MN is the isocost line for country I. The slope of the isocost line is $(w/r)_I$. At this isocost line, steel will be produced at X and cloth will be produced at point Y. Thus, the same isocost yields the isoquant S_1 of steel and C_1 of cloth.

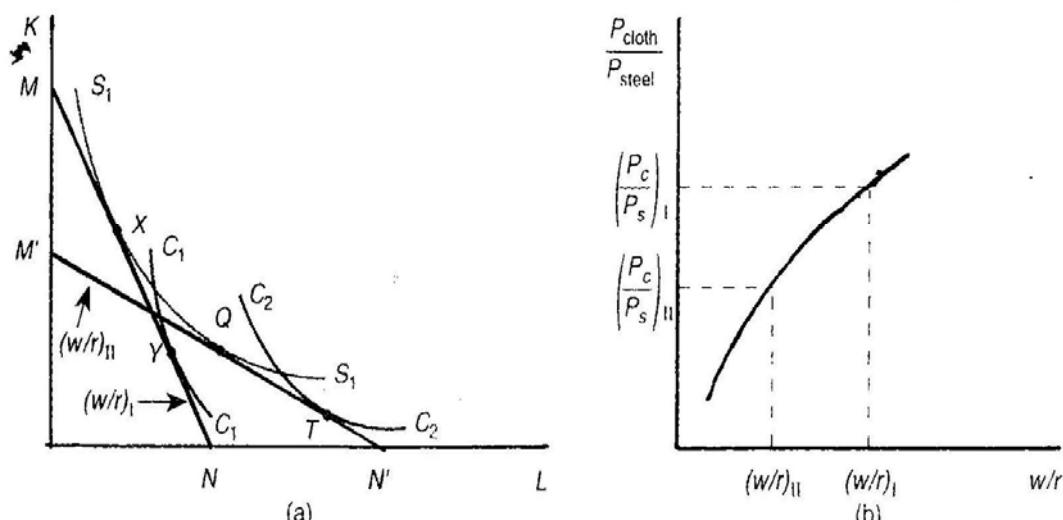
For country II, since it is labor abundant, $(w/r)_{II} < (w/r)_I$, a flatter isocost line is present in country II ($M'N'$). Country II would select point Q for steel and T for cloth. The corresponding isoquants are S_1 and C_2 .

Hence in country II C_2 units have the same cost as S_1 , while in country I only C_1 units, (a smaller quantity than C_2) could be produced for the same cost as S_2 . Thus, cloth is relatively cheaper in country II and steel is relatively cheaper in country I.

$$(P_{cloth}/P_{steel})_{II} < (P_{cloth}/P_{steel})_I$$

The conclusion is that a higher (w/r) leads to higher relative price of cloth. The H-O relationship is illustrated in the second graph. An increase in wage rate relative to the price capital will lead to an increase in the price of labor-intensive good, cloth, relative to the price of capital intensive good, steel.

FIGURE 4 Relative Factor Prices and Relative Product Prices



It is clear that different relative factor prices will generate different relative commodity prices in autarky. Consequently, there is a basis for trade and each country will export the good that it can produce less expensively: steel for country I and cloth for country II.

Extension: Appropriate technology with isocost-isoquant analysis

1. Factor price equalization

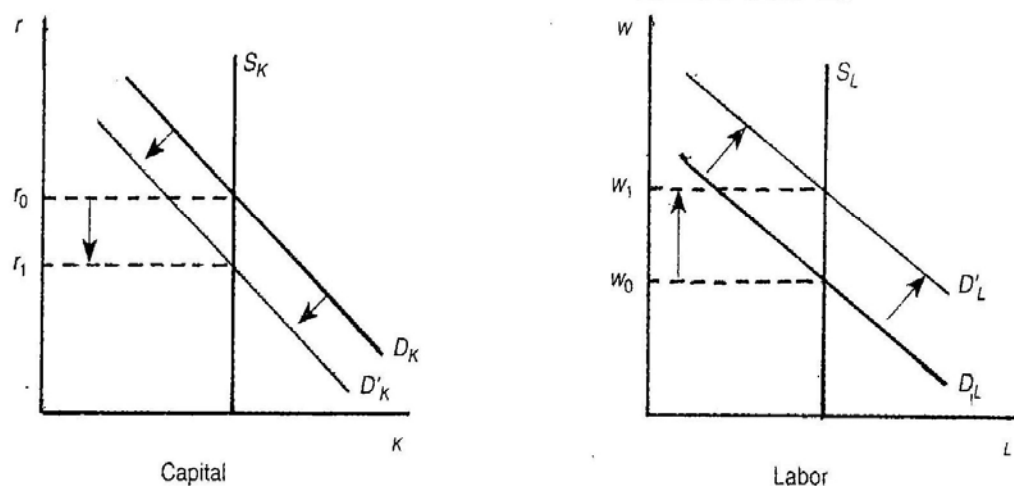
The discussion of H-O demonstrated that the convergence of product prices takes place as the price of the product using the relatively abundant factor increases and the price of the product using the country's scarce factor prices falls. This change in final product prices has implications for the price of factors in both of the participating countries.

Let us again consider two countries producing cloth and steel, with cloth the labor-intensive good and steel the capital-intensive good. Country I is the capital abundant country and country II the labor abundant country.

With the opening of trade, the price of cloth rises and the price of steel falls in country II. This indicates that producers in country II will produce more cloth and less steel. Assuming perfect competition, production will shift along the PPF toward more output of cloth and less of steel. For this to happen, resources must be shifted from steel production to cloth.

However, the bundle of resources released from steel production is different from the bundle absorbed by increased cloth production because the relative factor intensities of the goods differ.

FIGURE 5 Factor Price Adjustments with Trade



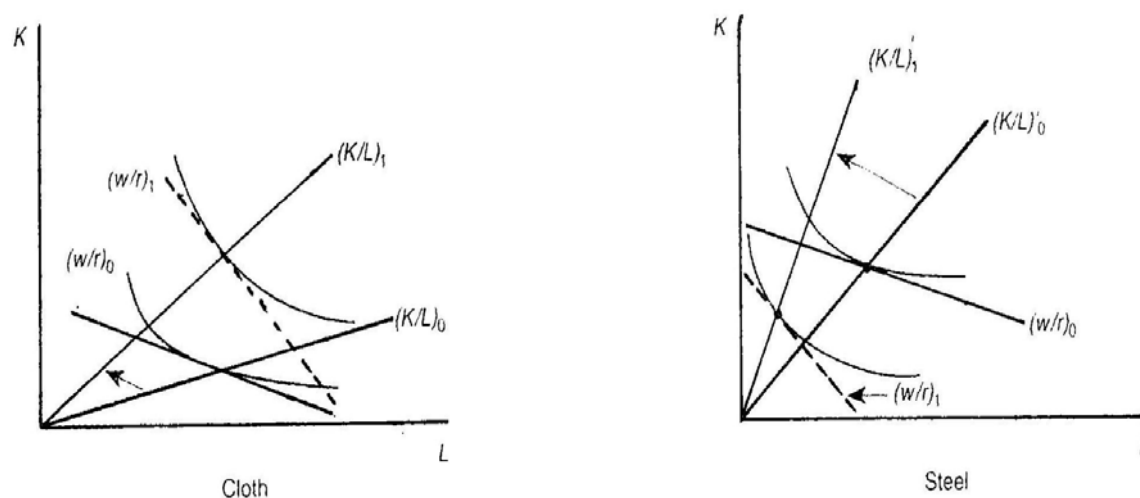
The graph above shows that assuming the factor supply is fixed. The country II production shifts away from capital-intensive production and toward labor-intensive good cloth. The expansion of cloth production will lead to an increase in overall demand for labor because cloth is labor-intensive relative to steel. At the same time, the reduction in steel production leads to a decline in the overall demand for capital. These shifts will result in an increase in the price of labor and a decrease in the price capital.

Thus, the factor price ratio $(w/r)_{II}$ will rise and induce producers to a different equilibrium point on each respective isoquant. Note that these price and production

adjustments lead to higher K/L ratio in both industries in this labor abundant country I.

Let us see why this is the case. As the production of labor-intensive cloth expands and the production of capital-intensive steel declines in country II, the price of labor rises and the price of capital declines. This change in price is depicted by as the change from $(w/r)_0$ to $(w/r)_1$. The relative increase in the cost of labor leads producers to substitute some capital for labor, that is, to move along the production isoquant in both industries. This factor substitution results in a rise in the K/L ratio from $(K/L)_0$ to $(K/L)_1$ in cloth production and from $(K/L)'_0$ to $(K/L)'_1$ in steel production. Because of the increase in cloth production, this factor-use adjustment takes place along a higher isoquant, while the reduction in steel production causes this adjustment to take place along a lower isoquant.

FIGURE 6 Producer Adjustment to Changing Relative Factor Prices Accompanying International Trade



In country I, a similar adjustment takes place. The relative price of steel rises and producers produce more steel and less cloth. The expansion in steel production and the contraction in cloth lead to an increase in overall demand for capital and a decrease in demand for labor. So the relative price ratio $(w/r)_1$ declines. Producers will substitute labor for capital in both industries until the ratio of factor prices is again equal to the slope of the production isoquants. As a result, K/L ratio in country I will fall in both industries.

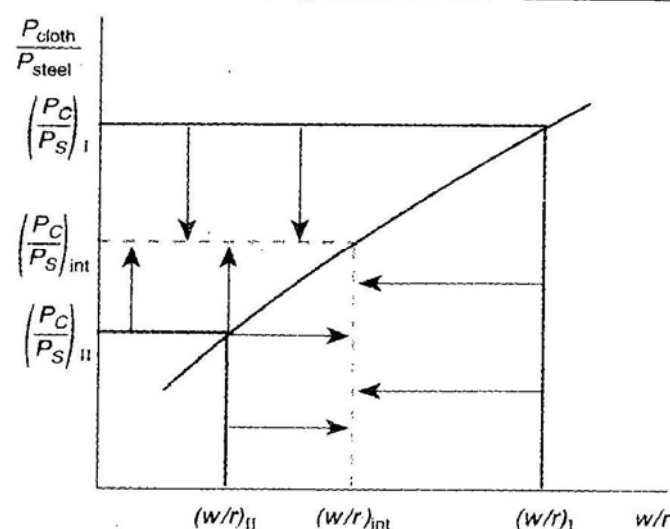
Combining the general equilibrium results of country I and country II reveals an interesting phenomenon:

Prior to trade, $(w/r)_I > (w/r)_{II}$. However, with trade, the factor price ratio in country I falls while in country II rises. Trade will expand until the two countries face the same set of relative factor prices. This result is known as the factor equalization theorem, often referred to as the next important contribution of the H-O analysis.

In equilibrium, with both countries facing the same relative price (and absolute) product prices, with both having the same technology, and with constant returns to scale, relative (absolute) costs will be equalized. The only way this can happen is, if, in fact, factor prices are equalized.

Trade in final goods essentially substitutes for movement of factors between countries, leading to an increase in the price of the abundant factor and a fall in the price of the scarce factor among participating countries until relative factor prices are equal as demonstrated in the graph below.

FIGURE 7 Factor Price Equalization with Trade



In the diagram, country II is assumed to be labor abundant and country I capital abundant. So the relative price of labor-intensive cloth is relatively lower. That is,

prior to trade, $(P_c/P_s)_{II} < (P_c/P_s)_I$. With initiation of trade, $(w/r)_I$ begins to fall and $(w/r)_{II}$ begins to rise. These movements will continue until each country's factor prices are consistent with the new international terms of trade, $(P_c/P_s)_{int}$. This will occur only when $(w/r)_{II} = (w/r)_I = (w/r)_{int}$. That is, relative prices are equalized between the two countries. Given the assumptions of the H-O model, absolute prices for given factors are also equalized.

Despite the limitations, the H-O model provides some helpful insights into the likely impact of trade on relative factor prices. Trade based on comparative advantage should tend to increase the demand for abundant factor and ultimately exert some upward pressure on its price, assuming the presence of unemployed resources does not entirely absorb the price pressure. Thus, for labor abundant country, trade can offer a way to employ more fully the abundant factor and/or to increase its wage and at same time, earn scarce foreign exchange necessary to import needed capital goods. The experience of Taiwan supported this view and demonstrated that in a general way, the factor price movements described above do occur. Finally, Mundell (1957) noted that the same result would obtain with respect to commodity prices and factor prices if factors were mobile between countries and final products were immobile internationally. In this instance, the relatively abundant factors would move from relatively low-price countries to high-price countries, causing factor price movements similar to those described. These factor movements would continue until factor (commodity) prices are equalized, assuming that such movement of factors is costless. Thus, concerning their impact on prices, goods movements and factor movements are substitute for each other.

2. The Stolper-Samuelson Theorem

The Stolper-Samuelson Theorem was developed in 1941. The initial article focused on the income distribution effect of tariffs, but later on was employed to explain the

income distribution effects of international trade in general in the literature.

Assume that a labor-abundant country initiates trade. This will lead to an increase in the price of the abundant factor labor and decrease in the price of the scarce factor capital. Assuming also that full-employment takes place both before and after trade, it is clear that labor's total income has increased, since the wage has increased and the labor employed remains the same. Similarly, the nominal income share of capital will fall since the price of capital has fallen and the capital employed remains the same level.

Question: It is important to note that the ability to obtain goods and services, that is income, depends not only on changes in income but also on the changes in product prices. First, workers who consume only the cheaper imported capital-intensive good are clearly better off, since their nominal income has increased and the price of capital-intensive good has fallen. Second, however, it is not clear if the workers consume only the labor-intensive good. The reason is that while the workers' income has increased, the price of the good they consume has also increased. If their income has increased more than the price of the labor-intensive good, their real income would increase. However, if their real income has increased less than the price of the labor-intensive good, their real income would decrease.

Using the equilibrium condition which comes about in competitive factor markets, we can demonstrate that the wage rate in the labor-abundant country will rise relatively more than the price of the export good.

In equilibrium, labor's wage is equal to its marginal product of labor (MP_L) times the price of the export good (called the marginal value of product of labor).

$$w = P \cdot MP_L$$

In the above analysis, we know that w and P (price of the export good) are increasing, the question is which is rising relatively more? It really depends on the change in MP_L .

If labor is becoming more productive, then wages will rise more than the price of the export good. In this case, the real income will be rising. If labor is becoming less productive, then wage increases will be outpaced by rising export-good price.

In general, with trade, the labor abundant country will find the price of capital falling and wage rate increasing. Its producers will respond by using relatively more capital and relatively less labor in production. So K/L ratio would increase. This would increase the marginal product of labor or labor productivity. This will unambiguously increase the real income of labor.

Thus, we conclude that the real income share of the owners of the abundant factor increases with trade. We can similarly demonstrate that the real income of the owners of the scarce factor capital is decreasing with trade.

Thus, the third aspect of the H-O analysis reading the income distribution effects of trade is explained in the more formal way by Stolper-Samuelson: With full employment before and after trade takes place, the increase in the price of abundant factor and the fall in the price of the scarce factor because of trade imply that the owners of the abundant factor will find their real incomes rising and the owners of the scarce factor will find their real income falling.

With this conclusion, it can be predicted that owners of abundant factors tend to be free traders while owners of scarce factors tend to favor trade restrictions. For example, in the US, agricultural producers and owners of technology and capital-intensive industries have tended to support expanding trade or dismantling trade restrictions while organized labor has tended to oppose the expansion of trade.

Aspects of H-O analysis: (1) H-O theorem; (2) factor price equalization; (3) Stolper-Samuelson; (4) Ribezynski theorem.

Core Theory-Neoclassical Trade Theory and other Models-Other Additional Theories

We will review some of the more recent developments on the causes and consequences of trade. The newer approaches depart from trade theory presented earlier by relaxing several assumptions employed in the basic trade model. The conclusion of the survey would show that the actual causes of trade are more complex than those portrayed in the basic H-O model.

1. The Imitation Lag Hypothesis

The Imitation lag hypothesis international trade theory was introduced in 1961 by Michael V. Posner. To some extent, this theory has paved the way for the product cycle theory.

Feature 1: Technology is not the same everywhere. The hypothesis relaxes the assumption in the H-O analysis that the same technology is available everywhere. Instead, it assumes that the same technology is not always available in all countries and that there is a delay in the transmission or diffusion of technology from one country to another.

Feature 2: Imitation lag. Consider country I and country II. Suppose a product appears in country I due to successful efforts of research and development teams. According

to the limitation lag theory, this new product will not be immediately produced by firms in country II. There is an imitation lag. The imitation lag is defined as the length of time between the product's introduction in country I and appearance of the version of the product produced by firms in country II.

The imitation lag includes a learning period during which the firms in country II must acquire technology and know-how in order to produce the product. In addition, it takes time to purchase inputs, install equipment, process the inputs, bring the finished product to market and so.

Feature 3: Demand lag. The demand lag is the length of time between the product's appearance in country I and its acceptance by consumers in country II as a good substitute for the product they are currently consuming. This lag may arise from loyalty to the existing consumption bundle, inertia and delays in information flows.

The point of importance in the imitation hypothesis is that trade focuses on new products. How can a country become a continually successful exporter? By continually innovating.

2. The product cycle theory

The product cycle theory builds on the imitation lag hypothesis in its treatment of delay in the diffusion of technology.

Vernon focused on the development of a new product. The new product would have two principle characteristics: (1) it will cater high-income demands because the US is a high income country, and (2) it promises, in the production process, to be labor-saving and capital-using in nature. It is because the US is widely regarded as a labor-scarce country.

The theory divided the life cycle of the product into three stages. The first stage is the new product stage. In this stage, the product is produced and consumed only in the US. Firms produce the product in the US because demand is located there.

The second stage is called maturing product stage. In this stage, some general standards for the product and its characteristics begin to emerge and mass production techniques begin to be adopted. There is, thus economies of scale. In addition, foreign demand for the product grows. The US begins to export the product to other high-income countries. Over time, the production will move from the US to other high-income countries. The exports of the US will fall and its production will drop. The other high-income countries will start to export to the US.

The final stage of the cycle is called the standardized stage. The developing countries will take over the production and begin to export.

In summary the theory postulates a dynamic comparative advantage because the country source of exports shifts throughout the life cycle of the product. First, the innovating country exports the product, but then displaced by other developing countries, which in turn ultimately displaced by developing countries.

From t_0 to t_1 , the US is producing the new product for the home market and there is no trade. From t_1 to t_2 the US exports the good to other developed countries. T_2 onward,, the US imports from other developed countries and increasingly from developing countries.

3. The Linder theory

The theory was a dramatic departure from the H-O in that it is exclusively

demand oriented. The H-O approach was primarily supply oriented. Linder theory focuses on the manufactured goods.

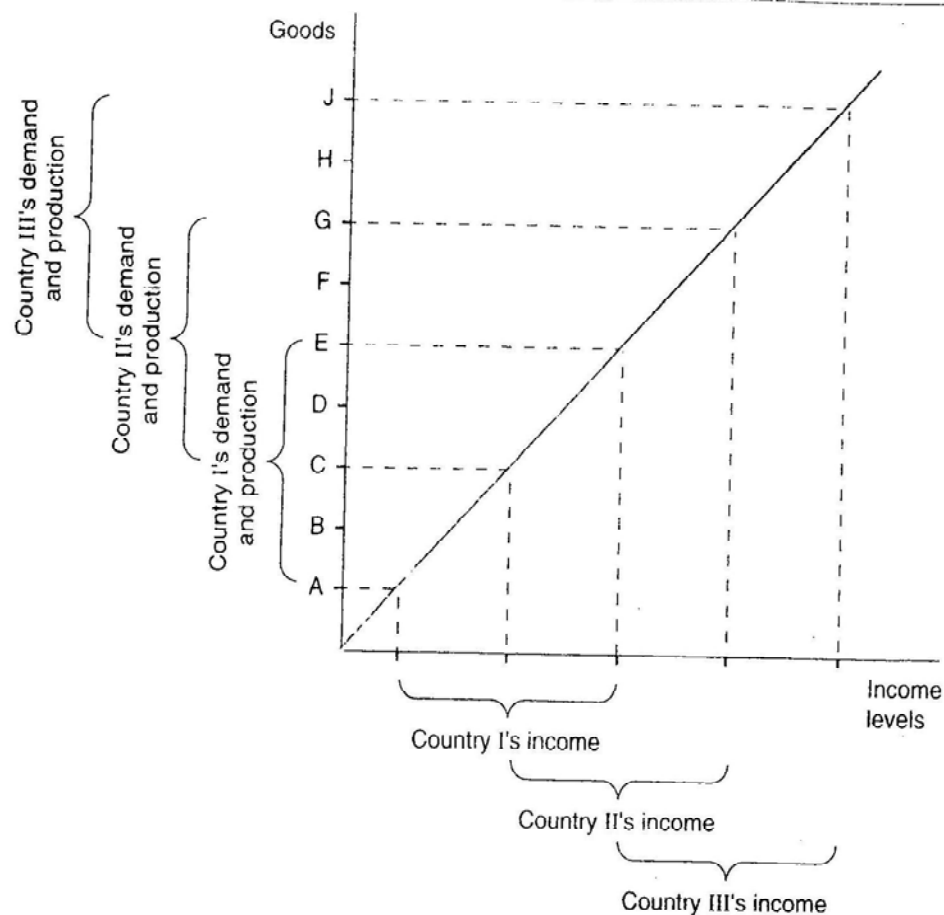
The tastes of consumers are determined by their income levels. The pattern of tastes will determine the demand for the manufactured products. The demand will generate a production response of that country. So the production pattern of country would reflect the income levels.

Which goods will be traded? Trade will occur in goods that have overlapping demand.

The theory implication: International trade in manufactured good will be more intense between countries with similar income levels than between countries with dissimilar income levels.

The Linder theory did not specify the direction of the trade. This could alternatively be explained by product differentiation or intra-industry trade.

FIGURE 2 Overlapping Demands in the Linder Model



In the diagram above, the income level of country I will yield a demand for goods A, B, C, D and E. Country II's higher income yield a demand for goods C, D, E F and G. Country III's even higher income yields a demand for goods E, F, G, H and J. According the Linder hypothesis, there will be an interest in trade with overlapped goods demanded. So countries I and II would trade E, F and G. Because their respective income levels do not generate common demands for any good except E, countries I and II will trade each other only in that good.

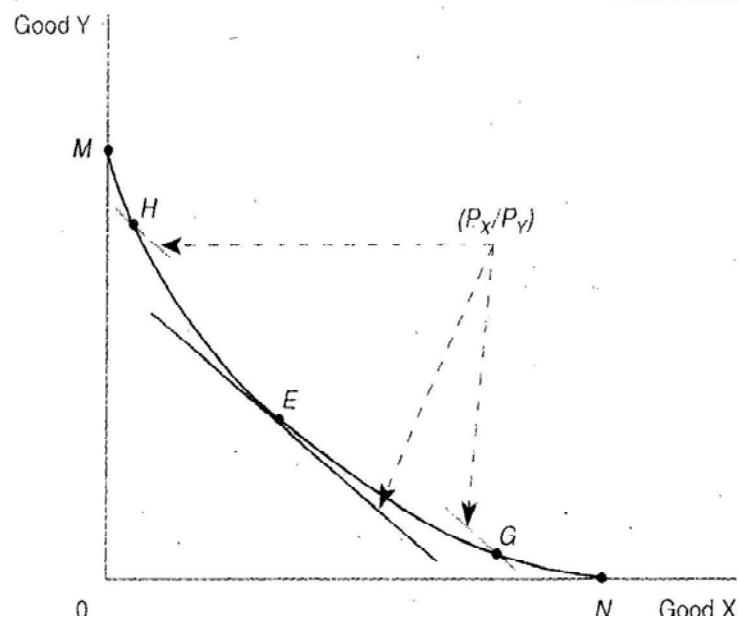
4. Economies of scale

Assume a two-commodity world where both industries experience economies of scale. Further, the economies of scale are such that the PPF is convex to the origin.

Suppose the economy is initially located at point E where PPF is tangent to the autarky price line (P_x/P_y).

Such autarky equilibrium is unstable. Thus, a slight departure from E will not produce a return to E. Consider a point to the right of E, such as G, which has same goods prices (P_x/P_y) as E. Since $(P_x/P_y) > (MC_x/MC_y)$, there is an incentive to produce more of good X and less of good Y. The economy will move from G to N. If the economy is located instead at H production will move from H to M.

FIGURE 3 A Convex-to-the-Origin Production-Possibilities Frontier (PPF)

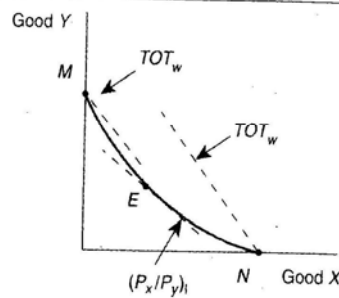


Assume that country I has reached its autarky equilibrium at E. The internal price ratio is (P_x/P_y) . With the trade the price ratio is TOTw. The country will specialize in the production of X at N and trade along the price line represented by TOTw to obtain a higher indifference curve.

For country II, it has identical PPF and identical demand. The relative price ratio is also TOTw. This country can completely specialize in producing Y at M. Then trade along TOTw to obtain a higher indifference curve.

In the case of classical world and H-O framework, trade could not take place. But with economies of scale, there is possibility of trade.

FIGURE 4 The Convex PPF and Gains from Trade



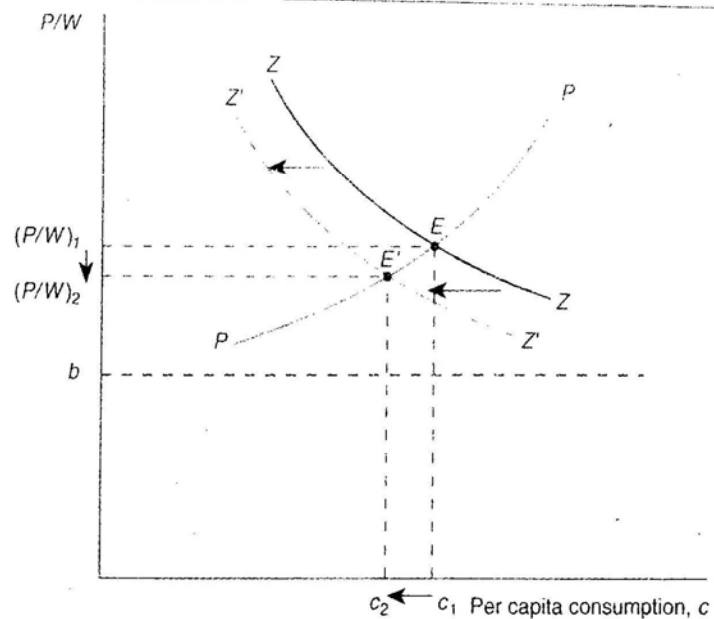
5. The Krugman model

This theory represents a family of newer models that has emerged since H-O. While Krugman has developed other models we refer to this widely cited model published in “Increasing returns, monopolistic competition and international trade”, Journal of International Economics 9, no. 4, November 1979, pp-469-79 as the Krugman model.

This model rests on two features that are sharply distinct from those traditional models: economies of scale and monopolistic competition.

The Krugman model can be best illustrated by the graph below.

FIGURE 6 Basic Krugman Diagram



On the horizontal axis, we place per capital consumption, c . On the vertical axis, we place the ratio of the price of the good to the wage rate, (P/W) .

The upward sloping PP curve represents the relationship of the price of the good to marginal cost. As consumption increases, the demand becomes less elastic. Thus, the expression $[e_D/(e_D+1)]$ increases, with constant marginal cost, profit maximization indicates higher price. Thus, (P/W) rises as c increases, and the PP curve is upward sloping.

The ZZ curve reflects the phenomenon in monopolistic competition that economic profit for the firm is zero in the long-run equilibrium. To arrive at the downward slope, remember that zero profit means that in equilibrium price is equal to average cost at all points on the ZZ curve. If per capita consumption (c) increases, average cost is reduced because of the economies of scale phenomenon specified in the model. Hence, to maintain the zero profit and to move back to the ZZ curve, price must be reduced. This yields a downward slope for the curve.

At E, the representative monopolistically competitive firm is in equilibrium because it

is charging its profit-maximizing price and this is long-run equilibrium position because economic profit is zero.

In the figure, the firm settles at $(P/W)_1$, and the per capita consumption is c_1 .

Suppose we designate the home country of this representative firm as country I. Another country called country II would have identical tastes, technology and characteristics of factors of production as country I. Traditional theory would conclude that there is no incentive to trade in this case. However, Krugman and Linder would disagree.

When the two countries are opened to trade, the market size is being enlarged for each representative firm in both countries because there are more potential buyers of any firm's good. When market size is enlarged, economies of scale can come into play and production costs can be reduced for all goods.

The figure represents country I's situation. With trade, the total consumption of the good would increase. But if the output is held constant, with larger consuming population, there is thus less per capita consumption of this firm's product at each (P/W) . This is equivalent to shifting the ZZ curve to $Z'Z'$. With this shift, there is a disequilibrium at E. The movement will take place at the new equilibrium at E'. In this process, (P/W) falls from $(P/W)_1$ to $(P/W)_2$ and the per capita consumption of the firm's product falls from c_1 to c_2 .

So with international trade, the size of the market has increased. The consequence is per capita consumption would decrease but the total consumption of each good would increase. In addition, the fall in (P/W) means the real wage has increased.

6. The reciprocal demand model

A monopoly may charge a different (lower) price in the export market than in the home market. Such price discrimination is called dumping.

There are two countries and two firms producing a homogenous product. An important feature of the model is that there is transportation cost. If the transportation cost is sufficiently each firm will only sell in the domestic market.

However, if the transportation cost is not very high, and the home firm notes that the price charged by the foreign firm in the foreign market exceeds the home firm's marginal cost plus the cost of transportation, the home firm would want to sell the product in the foreign market.

Similarly, if the foreign firm notices that the price charged in the home market exceeds its marginal cost it would want to sell in the home market. Clearly, there are possibilities to trade for both countries.

Once the firms in the two countries start to sell in each other's market we enter a market structure of duopoly.

The main point of the model is: International trade in a homogenous product is occurring with each country both exporting and importing the product.

For welfare implications, Brander and Krugman noted that with the rival the market price will fall and consumers will benefit. However there is a waste of sending identical products to each other. So the outcome is uncertain.

7. The gravity model

The model differs from other theories in that it tries to explain the volume of trade and does not focus on the composition of trade.

The model uses an equation framework to predict the volume of trade on a bilateral basis between the two countries. The form of the equation framework has some similarity to the law of gravity in physics.

The model usually considers the following variables to explain the volume of exports from country I to country II.

- GNP or GDP for country II.
- GNP or GDP for country I for capacity of supply.
- Some measure of distance between I and II as a proxy for transportation cost.

Sometimes other variables are also included.

- Population size in the exporting and importing country.
- A variable reflecting economic integration arrangement.

Empirical tests have shown that the gravity equation works best for similar countries that have considerable intra-industry trade with each other, better than it did for countries with different factor endowments. At the minimum, these findings suggest that product differentiation is indeed a phenomenon to be considered above and beyond factor endowments.